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ABSTRACT

Preliminary results compared computer assisted methods versus traditional mathematics processes to determine the nutrient content of foods for a dietary evaluation study. Objectives were to compare the two methods with regard to (1) computation time spent by students and staff, (2) accuracy, and (3) cost. The need for more sophisticated methods and procedures to streamline traditional student dietary evaluation methods used in nutrition courses is discussed. (Author/CMV)

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PROGRESS REPORT ON A COMPUTER ASSISTED INSTRUCTION MODULE FOR A DIETARY EVALUATION EXPERIENCE FOR A UNIVERSITY FOOD AND NUTRITION COURSE

by

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PROGRESS REPORT ON A COMPUTER ASSISTED INSTRUCTION MODULE FOR A DIETARY EVALUATION EXPERIENCE FOR A UNIVERSITY FOOD AND NUTRITION COURSE

By Mrs. Angela Boren

PROBLEM:

This paper is addressed to a two-fold problem: 1) the development of a computer assisted dietary evaluation program and 2) determination of the effectiveness of the CAI program vs the traditional method of manual tabulation and computation in an introductory food and nutrition course at the university level.

INTRODUCTION:

At Texas Tech University, the dietary study is a major learning experience for practical, personal application of the cognitive concepts of nutrition in an introductory nutrition course. In the traditional method, students recorded all food and beverages consumed during one 24 hour period. Foods were categorized according to the Food Group System. Using a food composition chart available from the U.S. Department of Agriculture, the student identified each food in the table, determined a quantity factor by comparing the amount eaten with quantity listed in the table, then computed the quantity of 11 different nutrients consumed in that food. The process was repeated for each food and beverage for the entire 24 hour period, amounts of nutrients from foods in each of 5 food groups was subtotaled, a grand total of nutrients for the whole day was obtained, and the percentage of Recommended Dietary Allowances for each nutrient was determined. The last step was to evaluate the daily food intake in relation to the Food Group System, RDA, foods liked or disliked, meals skipped, etc., and to justify the good food habits and/or recommend changes where these seemed necessary. This process requires 10 steps in all, some of which are very time consuming and allow the possibility of numerous errors.

In contrast, the CAI program requires these steps:

1) record food consumed
2) identify food in food composition table
3) record food code
4) record factor for amount eaten
5) evaluate nutrient data print-out

Punching cards for batch processing is not included as a step in this method since it is performed by a student assistant. The project may continue to develop an interactive method for students to use a remote computer terminal and receive hard copy results.

OBJECTIVES:

The objectives of the study are to:

1) develop a computer program for dietary analysis

2) evaluate the effectiveness of the CAI method vs traditional method considering:
   a) time spent by students
   b) time spent by staff
   c) accuracy
3) evaluate the affective responses of both students and faculty to the use of the computer as a teaching tool vs the traditional method.

BRIEF REVIEW OF LITERATURE:

A review of literature to determine the uses of the computer in the food and nutrition field of study revealed that computer applications are being used in the dietary departments of many large-scale institutional feeding operations for inventory, production and quality control, as well as for cost accounting and menu planning (Hoover, 1976). Computerized analysis of dietary intake for nutrition research and in medicine have been reported (Witschi, 1976). In education, simulated hospital experiences, such as Dietetic Com-Pak (Hoover, 1974) developed at the University of Missouri, allow students in dietetics to develop some skills and confidence in management by computer. Instances of computer assisted instruction, CAI, have been reported in various sciences, mathematics and engineering since the 1960's (Hickey, 1972; Alpert and Bitzer, 1970). Sarah Short (1975) of Syracuse University is a leader in the development of self-instructional methods. Wade and Thiele (1973) also of Syracuse, have reported using interactive CAI in a college nutrition program. Beauchamp and Magrabi (Jan. 1972, Nov. 1972) introduced programs such as NUCOIN$ and GROCR used in extension to aid homemakers with food and consumer problems. However, the utilization of the computer to simplify and streamline the mathematical processes in dietary analysis as a means of evaluating personal food habits for nutrition education has received little attention. Food composition tables are available in the form of nutrient data files from USDA (Hertzer and Hoover, 1974). Thus, a logical step seems to be to apply the computer to alleviate the mundane manual mathematical applications students have previously used in the Dietary Study in F&N 131 at Texas Tech University.

METHODOLOGY:

Methodology for the study includes:
1) the development of
   a) an instructional module for the Dietary Study,
   b) objective, multiple choice instruments as pretest and posttest to evaluate the achievement of cognitive objectives,
   c) a Likert-type scale and open-ended questions to evaluate affective reaction to the traditional and CAI methods,
   d) learning experiences for the module,
   e) the computer program for dietary analysis study, and
2) statistical analysis of results.

The development of the instructional module for the dietary study follows the model designed at Texas Tech University by Boren and Foree (1976). This model includes the subdivision of subject matter into manageable parts, such as a separate lesson within the module. Lessons for the Dietary Module are:

Lesson I: Dietary Record
Lesson II: Food Group System
Lesson III: Manual Tabulation and Calculation of Dietary Record
Lesson IV: Computer Coding of Dietary Record
Lesson V: Evaluation of Dietary Study

After research comparing the two methods is completed, the module will include only 3 lessons: Dietary Record, Computer Coding, and Evaluation. The lessons are color keyed for easy identification. The module is prefaced by an introduction to the Dietary Study, Rationale, and Instructions for the Module.

Components of each lesson are: Title; Rationale, which gives an explanation of the importance and purpose of the lesson; Objectives, written in behavioral terms; and Learning Experiences to enable students to achieve the objectives. The modular form provides each student with a specific written formula for completing the dietary study successfully. The modular format lends itself to either teacher-directed instruction or independent study. At this time, the module is used in a teacher-directed instructional approach. In the future, the dietary study module may be tested in independent study. The construction of criterion test items to evaluate the achievement of cognitive objectives is simultaneous to writing the behavioral objectives. Performing these two steps in conjunction is vital to the modular strategy of instruction. The basic theory of the system is that decisions of "what each student will be able to achieve at the end of the lesson" and "how the student will prove achievement" should be resolved before identification or development of learning experiences.

Other factors in the evaluation of the study will be statistical analysis of the time spent by students using the manual method vs the computer method, time spent by staff in correcting papers for each method, and error rate by each method.

A slide series on the Food Group System was developed as one the learning experiences for the module. This learning experience features photos of real foods in usual portion sizes as related to servings in the Food Group System. The slides will be applicable, also, for students in other classes for review of the practical uses of food groups in meal planning and/or as a simple tool for evaluation meals.

The project has taken a lot of time in development, however, it has all progressed smoothly except for the computer program itself. Several existing programs were examined but none produced the desired output. Therefore, a Kansas State University program was modified for our purposes. The original program was written to utilize the nutrient data deck from Handbook 72 to rank the quality of a diet as Excellent, Good, Fair or Poor based upon the percentages nutrients meeting RDA. The Texas Tech revision updated the program to use the most recent RDA and will give a print-out of total nutrient content by food group, as well as total nutrient content of the day and percentage of RDA achieved that day. Additionally, the program will allow for the input of food intake for several days with the output as average nutrient content for the period and percent of RDA achieved. The rationale for this being that students are expected to be able to analyze dietary records for several days by the

computer method in about the same time as one day by the traditional method, thus giving more reliability and confidence to the study.

Test items in objective, multiple-choice form are written for each behavioral objective to make up the pretest and posttest for cognitive evaluation of the study. Affective evaluation of the CAI strategy will be by means of Likert-type scales and open-ended responses by students and faculty.

PRELIMINARY RESULTS:

A preliminary trial of the module was possible with an F&N 131 class of 16 students in the summer of 1977. Complete records were available for only 9 students so the results are certainly not conclusive. However, this gave us a chance to test the module and make some revisions before the Pilot Study this Fall.

On the basis of this very small sample, the following information was obtained (Table 1): Nine subjects comprised the sample; all were female, one married and eight single; seven were HEED majors and two were Elementary Education majors. GPA's ranged from 2.00 to 4.00 on a 4 point scale. Time, in minutes, for students to analyze the nutrient content or food intake for one day by the traditional method ranged from 22 minutes to 90 minutes, with a mean of 50.5 minutes. Time, in minutes, for computer coding the food intake for a one day food intake, ranged from 11 minutes to 34 minutes, with a mean of 30.4 minutes. The difference between methods was 11 minutes to 61 minutes, with a mean of 30 minutes saved by the computer method.

Results of the cognitive evaluation indicated a range of scores on the pretest from 43 to 70 with a mean of 54.5 vs the scores on the posttest which ranged from 65 to 86 with a mean of 75.4.

On the basis of this small sample, the CAI program would appear to be helpful to students by saving time on manual calculations. This would allow for evaluation of dietary records of several days in the same amount of time and would give the dietary study more reliability.

TABLE 1. PRELIMINARY TRIAL

Summer 1977

Subject No.	Marital Status	Sex	Class	College	GPA	Time (min.) Manual	Time (min.) Computer	Time (min.) Dif.	Scores (%) Pretest	Scores (%) Posttest	Scores (%) Dif
1	S	F	3	H Ec	2.46	65	30	35	49	70	21
2	S	F	4	Ed	2.71	55	34	21	43	81	38
3	M	F	3	H Ec	4.00	85	26	59	70	86	16
4	S	F	1	H Ec	2.00	52	18	34	46	76	30
5	S	F	2	H Ec	3.00	60	20	40	49	68	19
6	S	F	2	Ed	2.52	42	18	24	62	81	19
7	S	F	2	H Ec	3.09	22	11	11	57	76	19
8	S	F	4	H Ec	2.83	65	21	44	65	76	11
9	S	F	4	H Ec	3.06	90	29	61	51	65	14
				Mean		50.5	30.4	30	54.5	75.4	20.8

RELEVANT LITERATURE

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